WHAT IS CLAIMED IS:

1. A developing device comprising:

a developer carrying unit including a non-magnetic sleeve rotatable and a magnetic field generating unit;

a developer receptacle configured to receive a two-component developer including toner and a magnetic carrier; and

an opening through which a portion of the developer carrying unit opposite to a latent image carrying unit configured to carry a latent image is exposed, wherein

the magnetic field generating unit is configured to

draw the two-component developer onto a surface of the developer carrying unit so as to carry the two-component developer to the opening,

form a magnetic brush by erecting the two-component developer on the developer carrying unit at the opening,

apply a developing bias on the developer carrying unit so as to develop the latent image with the toner supplied to the latent image on the latent image carrying unit from the magnetic brush, and

an amount of weakly charged toner in the two-component developer passing through the opening per unit time is not greater than 200 g·mm/min, wherein the amount of weakly charged toner is expressed by an equation, which is

the amount of weakly charged toner [g·mm/min] = total amount of the two-component developer to be drawn [g/min] × length of the opening [mm] × a concentration of toner [wt%] × percentage of weakly

charged toner [%]

wherein the total amount of the two-component developer to be drawn is expressed by an equation, which is

the total amount of the two-component developer to be drawn [g/min] = an amount of the two-component developer to be drawn [g/mm$^2$] × drawing width [mm] × linear velocity of a developing roller [mm/min]

and the percentage of weakly charged toner [%] is a percentage of toner having a charge of not less than - 0.1 fC/μm if the toner is negatively charged, and is a percentage of toner having a charge not greater than 0.1 fC/μm if the toner is positively charged, according to a distribution of charge per particle size.

2. The developing device according to claim 1, wherein a linear velocity of the developer carrying unit is not less than 9000 mm/min.

3. The developing device according to claim1, wherein the developing bias applied to the developer carrying unit does not include an alternating current component.

4. The developing device according to claim 1, wherein the magnetic field generating unit includes a magnetic pole configured to form the magnetic brush, wherein a decrement of a magnetic flux density in a normal direction of the developing magnetic pole is not less than 40 %.

5. An image forming apparatus comprising:

a latent image carrying unit configured to carry a latent image;

a developing device configured to supply toner to the latent image so as to develop the latent image on the latent image carrying unit into a toner image;

a transferring device configured to transfer the toner image to a medium, wherein the developing device comprises:

a developer carrying unit including a non-magnetic sleeve rotatable and a magnetic field generating unit;

a developer receptacle configured to receive a two-component developer including toner and a magnetic carrier; and

an opening through which a portion of the developer carrying unit opposite to the latent image carrying unit is exposed, wherein

the magnetic field generating unit is configured to

draw the two-component developer onto a surface of the developer carrying unit so as to carry the two-component developer to the opening,

form a magnetic brush by erecting the two-component developer on the developer carrying unit at the opening,

apply a developing bias on the developer carrying unit so as to develop the latent image with the toner supplied to the latent image on the latent image carrying unit from the magnetic brush, and

an amount of weakly charged toner in the two-component developer passing through the opening per unit time is not greater than

200 g·mm/min, wherein the amount of weakly charged toner is expressed by an equation, which is

the amount of weakly charged toner [g·mm/min] = total amount of the two-component developer to be drawn [g/min] × length of the opening [mm] × a concentration of toner [wt%] × percentage of weakly charged toner [%]

wherein the total amount of the two-component developer to be drawn is expressed by an equation, which is

the total amount of the two-component developer to be drawn [g/min] = an amount of the two-component developer to be drawn [g/mm$^2$] × drawing width [mm] × linear velocity of a developing roller [mm/min]

and the percentage of weakly charged toner [%] is a percentage of toner having a charge of not less than - 0.1 fC/μm if the toner is negatively charged, and is a percentage of toner having a charge not greater than 0.1 fC/μm if the toner is positively charged, according to a distribution of charge per particle size, wherein the developing device is configured to move the magnetic brush in a direction in which the latent image carrying unit is moved and at a speed faster than that of the latent image carrying unit so as to bring the magnetic brush in contact with a surface of the latent image carrying unit and to develop the latent image.

6. The image forming apparatus according to claim 5, wherein

an electric potential at a dark portion of the image carrying unit (hereinafter, "VD"), an electric potential after exposure to light (hereinafter, "VL"), and a developing bias voltage (hereinafter, "VB") satisfy an equation, which is

$$0 < |VD| - |VB| < |VD - VL| < 250\ V$$

and

a maximum quantity of toner adhered on the latent image carrying unit is controlled to be not greater than $1.5 \times X$, wherein X is a minimum quantity of toner adhered on the latent image carrying unit required to obtain a saturated image density, and the minimum quantity X is expressed by an equation, which is

$$X = \text{particle size} \times \text{true specific gravity} / \text{transfer rate} \times 0.6$$

wherein the minimum quantity X is an amount of toner adhered when the toner exists in at least 60 % of a space equivalent to a thickness of a particle size of toner.

7. The image forming apparatus according to claim 5, wherein the toner has an average circularity greater than 0.96.

8. A process cartridge comprising:

a latent image carrying unit configured to carry a latent image; and

a developing device configured to supply toner onto the latent image so as to develop the latent image, wherein

the latent image carrying unit and the developing device are structured as an integrated unit,

the process cartridge is detachably connected to an image forming apparatus, and

the developing device comprises:

a developer carrying unit including a non-magnetic sleeve rotatable and a magnetic field generating unit;

a developer receptacle configured to receive a two-component developer including toner and a magnetic carrier; and

an opening through which a portion of the developer carrying unit opposite to the latent image carrying unit is exposed, wherein

the magnetic field generating unit is configured to

draw the two-component developer onto a surface of the developer carrying unit so as to carry the two-component developer to the opening,

form a magnetic brush by erecting the two-component developer on the developer carrying unit at the opening,

apply a developing bias on the developer carrying unit so as to develop the latent image with the toner supplied to the latent image on the latent image carrying unit from the magnetic brush, and

an amount of weakly charged toner in the two-component developer passing through the opening per unit time is

not greater than 200 g·mm/min, wherein the amount of weakly charged toner is expressed by an equation, which is

the amount of weakly charged toner [g·mm/min] = total amount of the two-component developer to be drawn [g/min] × length of the opening [mm] × a concentration of toner [wt%] × percentage of weakly charged toner [%]

wherein the total amount of the two-component developer to be drawn is expressed by an equation, which is

the total amount of the two-component developer to be drawn [g/min] = an amount of the two-component developer to be drawn [g/mm$^2$] × drawing width [mm] × linear velocity of a developing roller [mm/min]

and the percentage of weakly charged toner [%] is a percentage of toner having a charge of not less than - 0.1 fC/μm if the toner is negatively charged, and is a percentage of toner having a charge not greater than 0.1 fC/μm if the toner is positively charged, according to a distribution of charge per particle size.

9. An image forming apparatus comprising:

a latent image carrying unit;

a developing device including a surface conveyor configured to convey toner charged to a predetermined polarity adhered electrostatically on a toner carrier charged to a polarity opposite to that of the toner charged to a developing region opposite to a surface of the image carrying unit, wherein in the developing region, the developing

device is configured to transfer on a medium a toner image formed of the toner adhered on a latent image on a surface of the latent image carrying unit so as to form an image on the medium; and

a toner-amount adjusting unit configured to adjust an amount of toner to be adhered on the toner carrier before the surface conveyor conveys the toner to the developing region such that in the developing region a total charge on the toner adhered on the toner carrier is not greater than a total charge on the toner carrier.

10. The image forming apparatus according to claim 9, wherein the developing device is configured to develop the latent image with a one-component developer including the toner, and a surface of the surface conveyor is the toner carrier.

11. The image forming apparatus according to claim 9, wherein the developing device develops the latent image with a two-component developer including the toner and a magnetic carrier, and the magnetic carrier is the toner carrier.

12. The image forming apparatus according to claim 9, wherein the toner-amount adjusting unit is configured to adjust the amount of toner to be adhered on the toner carrier such that a ratio of the total charge on the toner to the total charge on the toner carrier is not greater than 80 %.

13. The image forming apparatus according to claim 9, wherein the toner-amount adjusting unit

comprises a member configured to receive an alternating-current voltage, and

is configured to form an alternating-current electric field between the member and the surface conveyor so as to adjust the amount of toner to be adhered on the toner carrier.

14. The image forming apparatus according to claim 9, wherein the toner-amount adjusting unit comprises a stirrer configured to stir the toner or a developer carried on a surface of the surface conveyor so as to adjust the amount of toner to be adhered on the toner carrier.

15. The image forming apparatus according to claim 9, wherein the toner carrier has a dynamic resistance of $1 \times 10^2$ ohms to $1 \times 10^{11}$ ohms.

16. The image forming apparatus according to claim 9, wherein the toner has an average circularity of not less than 96 %.

17. A process cartridge detachable from an image forming apparatus, wherein the image forming apparatus comprises:

a latent image carrying unit;

a developing device including a surface conveyor configured to convey toner charged to a predetermined polarity adhered

electrostatically on a toner carrier charged to a polarity opposite to that of the toner charged to a developing region opposite to a surface of the image carrying unit, wherein in the developing region, the developing device is configured to transfer on a medium a toner image formed of the toner adhered on a latent image on a surface of the latent image carrying unit so as to form an image on the medium; and

a toner-amount adjusting unit configured to adjust an amount of toner to be adhered on the toner carrier before the surface conveyor conveys the toner to the developing region such that in the developing region a total charge on the toner adhered on the toner carrier is not greater than a total charge on the toner carrier,

wherein the process cartridge comprises at least the latent image carrying unit, the developing device, and the toner-amount adjusting unit, which are structured as an integrated unit.

18. A developing device comprising:

a latent image carrying unit;

a developer receptacle having an opening facing the latent image carrying unit; and

a developer carrying unit configured to

be partially exposed to an inside of the developer receptacle through the opening,

carry as a magnetic brush a two-component developer including toner and a carrier with a magnetic field generating unit included in the developer carrying unit, and

supply the toner to a latent image on the latent image carrying unit in a developing region opposite to the latent image carrying unit, wherein a proportion of the toner satisfying equations, which are,

$$\mu Fq < Fdmax \quad \ldots (C1)$$

$$Fq = \frac{k}{4\pi\varepsilon_0}\left(\frac{q}{r}\right)^2 \quad \ldots (C2)$$

$$Fdmax = \frac{4}{3}\pi \cdot r^3 \cdot \sigma \cdot a \quad \ldots (C3)$$

is not greater than 10 %,.wherein Fq is an electrostatic adherence of the toner with respect to the carrier in the two-component developer, Fdmax is a maximum inertial force exerted on the toner at the opening, $\mu$ is a coefficient of kinetic friction, $\pi$ is pi, $\varepsilon_0$ is a dielectric constant in vacuum [F/m], k is a constant, q is an electric charge on toner particles [C], r is a radius of the toner particles [m], $\sigma$ is a density [$kg/m^2$], and a is a change in velocity of the magnetic brush [$m/s^2$].

19. The developing device according to claim 18, wherein a maximum of a change in magnetic flux density of a magnetic flux density distribution at the opening of the developer receptacle due to the magnetic field generating unit in the developer carrying unit is not greater than 0.45 T/deg.

20. The developing device according to claim 19, wherein the magnetic field generating unit includes a magnetic pole located opposite to the developing region, and the maximum of the change in magnetic flux density of the magnetic flux density distribution due to the magnetic pole is not greater than 0.45 T/deg.

21. The developing device according to claim 18, wherein a particle size of the carrier is not greater than 35 micrometers.

22. The developing device according to claim 18, wherein the toner includes particle number ratio of not less than 70 % of toner having a particle size from 3 micrometers to 7 micrometers.

23. The developing device according to claim 18, wherein a value obtained by dividing a weight average particle size by a number average particle size of the toner is not greater than 1.3.

24. A process cartridge comprising:

an image carrying unit configured to carry an electrostatic latent image; and

a developing device configured to convey a developer carried on a developer carrying unit to a developing region opposite to the image carrying unit and to develop a latent image on the image carrying unit to form a toner image, wherein the process cartridge is configured to be detachable from an image forming apparatus, wherein

the image forming apparatus comprises:

the image carrying unit;

a charging unit configured to charge the image carrying unit;

the developing device; and

a cleaning unit configured to remove toner remained on the image carrying unit after the toner image is transferred onto a medium,

wherein the developing device comprises:

the latent image carrying unit;

a developer receptacle having an opening facing the latent image carrying unit; and

a developer carrying unit configured to

be partially exposed to an inside of the developer receptacle through the opening,

carry as a magnetic brush a two-component developer including toner and a carrier with a magnetic field generating unit included in the developer carrying unit, and

supply the toner to a latent image on the latent image carrying unit in a developing region opposite to the latent image carrying unit, wherein a proportion of the toner satisfying equations, which are,

$$\mu Fq < Fdmax \quad \ldots (C1)$$

$$Fq = \frac{k}{4\pi\varepsilon_0}\left(\frac{q}{r}\right)^2 \quad \ldots (C2)$$

$$Fdmax = \frac{4}{3}\pi \cdot r^3 \cdot \sigma \cdot a \quad \ldots (C3)$$

is not greater than 10 %,.wherein Fq is an electrostatic adherence of the toner with respect to the carrier in the two-component developer, Fdmax is a maximum inertial force exerted on the toner at the opening, $\mu$ is a coefficient of kinetic friction, $\pi$ is pi, $\varepsilon_0$ is a dielectric constant in vacuum [F/m], k is a constant, q is an electric charge on toner particles [C], r is a radius of the toner particles [m], $\sigma$ is a density [$kg/m^2$], and a is a change in velocity of the magnetic brush [$m/s^2$].

25. The process cartridge according to claim 24, further comprising at least one of the charging unit and the cleaning unit.

26. An image forming apparatus comprising:

a latent image carrying unit;

a latent-image forming unit configured to form a latent image on the image carrying unit;

a developing device configured to develop the latent image on the image carrying unit; wherein the developing device comprises:

the latent image carrying unit;

a developer receptacle having an opening facing the latent image carrying unit; and

a developer carrying unit configured to

be partially exposed to an inside of the developer receptacle through the opening,

carry as a magnetic brush a two-component developer including toner and a carrier with a magnetic field generating unit

included in the developer carrying unit, and

supply the toner to a latent image on the latent image carrying unit in a developing region opposite to the latent image carrying unit, wherein a proportion of the toner satisfying equations, which are,

$$\mu Fq < Fdmax \quad \text{... (C1)}$$

$$Fq = \frac{k}{4\pi\varepsilon_0}\left(\frac{q}{r}\right)^2 \quad \text{... (C2)}$$

$$Fdmax = \frac{4}{3}\pi \cdot r^3 \cdot \sigma \cdot a \quad \text{... (C3)}$$

is not greater than 10 %,.wherein Fq is an electrostatic adherence of the toner with respect to the carrier in the two-component developer, Fdmax is a maximum inertial force exerted on the toner at the opening, $\mu$ is a coefficient of kinetic friction, $\pi$ is pi, $\varepsilon_0$ is a dielectric constant in vacuum [F/m], k is a constant, q is an electric charge on toner particles [C], r is a radius of the toner particles [m], $\sigma$ is a density [$kg/m^2$], and a is a change in velocity of the magnetic brush [$m/s^2$].

27. An image forming apparatus comprising:

a latent image carrying unit configured to carry a latent image;

a latent-image forming unit configured to form the latent image on the latent image carrying unit;

a developing device configured to develop the latent image on the image carrying unit; and

a process cartridge comprising:

the image carrying unit; and

the developing device configured to convey a developer carried on a developer carrying unit to a developing region opposite to the latent image carrying unit and to develop the latent image on the image carrying unit to form a toner image, wherein the process cartridge is configured to be detachable from the image forming apparatus;

a charging unit configured to charge the image carrying unit; and

a cleaning unit configured to remove toner remained on the latent image carrying unit after the toner image is transferred onto a medium, wherein the developing device comprises:

the latent image carrying unit;

a developer receptacle having an opening facing the latent image carrying unit; and

the developer carrying unit configured to

be partially exposed to an inside of the developer receptacle through the opening, and

carry as a magnetic brush a two-component developer including toner and a carrier with a magnetic field generating unit included in the developer carrying unit, wherein a proportion of the toner satisfying equations, which are,

$$\mu Fq < Fdmax \quad \text{... (C1)}$$

$$Fq = \frac{k}{4\pi\varepsilon_0}\left(\frac{q}{r}\right)^2 \quad \text{... (C2)}$$

$$Fdmax = \frac{4}{3}\pi \cdot r^3 \cdot \sigma \cdot a \qquad \ldots (C3)$$

is not greater than 10 %,.wherein Fq is an electrostatic adherence of the toner with respect to the carrier in the two-component developer, Fdmax is a maximum inertial force exerted on the toner at the opening, $\mu$ is a coefficient of kinetic friction, $\pi$ is pi, $\varepsilon_0$ is a dielectric constant in vacuum [F/m], k is a constant, q is an electric charge on toner particles [C], r is a radius of the toner particles [m], $\sigma$ is a density [$kg/m^2$], and a is a change in velocity of the magnetic brush [$m/s^2$].